

THE WILLIAM L. BRYANT FOUNDATION

American Studies

Report Number Six

**THREE ARCHAIC SITES
IN THE OCALA NATIONAL FOREST
FLORIDA**

by

Ripley P. Bullen

and

William J. Bryant

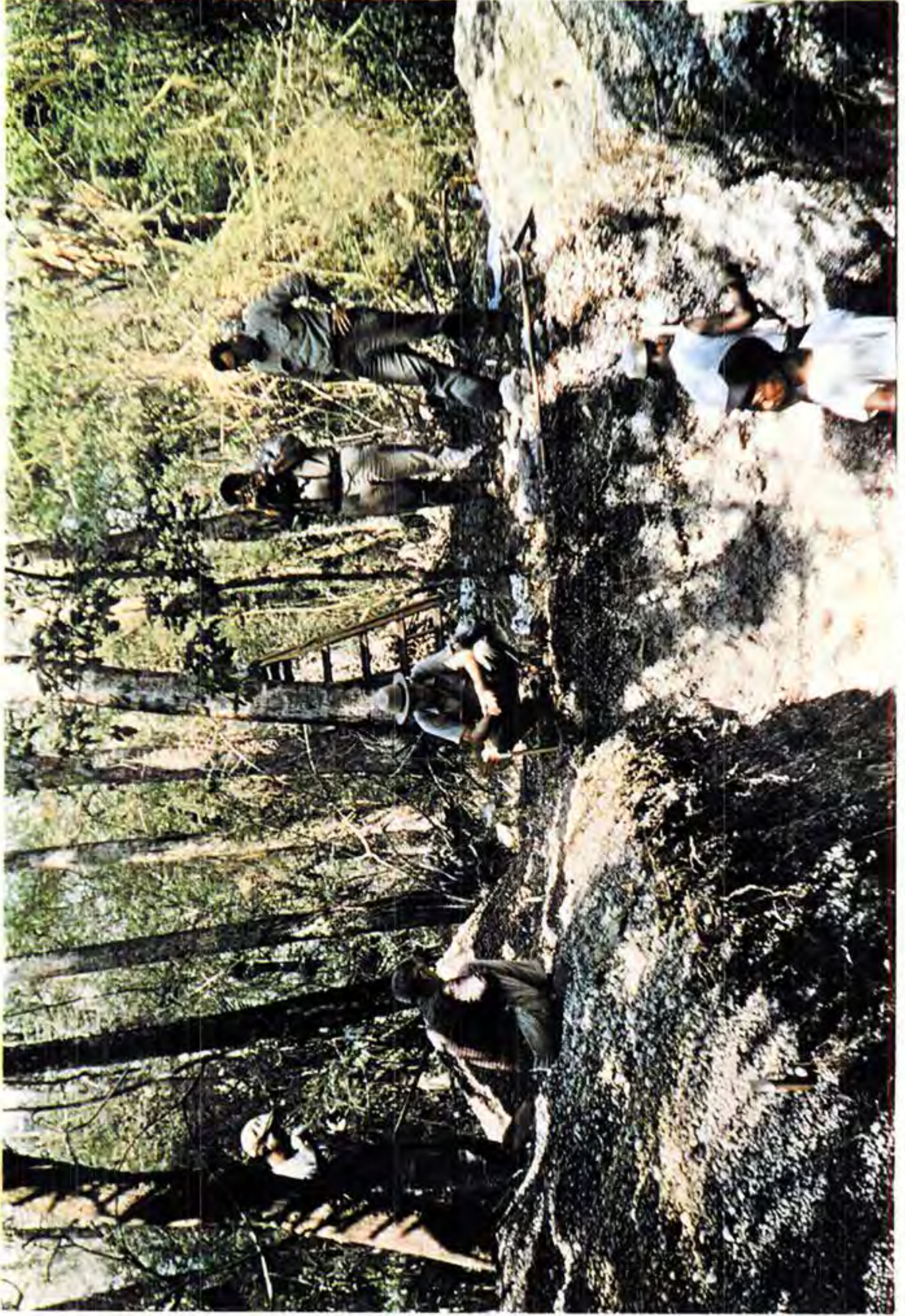


Plate I. Ocala National Forest Midden No. 2.

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PREFACE

Another gap in the archaeology of Florida's inland shell heaps has been successfully bridged by this, the sixth in the American Studies series by the William L. Bryant Foundation. This work has definitely eliminated many earlier suppositions as to the age of the shell middens and length of time required for their formation. The three shell middens discussed in this report are located in the Ocala National Forest and were among the earliest to have been inhabited in Florida.

Examination of these sites has also added to our knowledge of the culture of past inhabitants. It is significant in itself that definite radiocarbon analyses have established human inhabitation dating to about 3000 B.C., and that because of changes in land forms or ecological conditions, the middens were all but abandoned one thousand years later.

These three sites are protected under the provisions of the American Antiquities Act of June 8, 1906 (34 Stat. 225, 16 U.S.C. 433). The land on which they are located is administered by the Forest Service, United States Department of Agriculture, through the District Ranger at Eustis, Florida. After obtaining clearance from the Smithsonian Institution, a Special Use Permit for the archaeological investigation was issued by the Forest Service, who will continue to protect these middens but will also make them available for public use.

These and other sites of archaeological or historical significance on National Forest lands will be developed in whole or part as a segment of the Forest's recreation resource. The management

objective on sites such as these is to protect the sites from depredation while providing ample opportunities for use for the public. To attain this objective, these sites have been set up as archaeological areas in Multiple Use and Recreation Management Plans.

Middens No. 1 and No. 2 are the two largest mounds within the Bowers Bluff Archaeological Area. To facilitate public use, the Forest Service plans to develop a good access road and parking area, with water and sanitary facilities. A foot trail through the cabbage palm hammock will lead from the parking lot to both mounds.

Midden No. 3 is the largest of 3 mounds within the 1100 acre Kimball Island Scenic Area, which is accessible only by boat via the St. Johns River or Alexander Spring Creek. Current development plans for this area stipulate construction of a boat dock and shelter at Kimball Mud Lake, with foot trails leading to the middens.

The foot trails will serve two purposes. They will enable the visitor to commune with nature through the observation of the area's flora and fauna, and they will also be the medium for beginning the mound interpretation program. The Forest Service plans to interpret the mounds initially through the use of signs and guided tours. Any display of artifacts and accompanying artwork telling the prehistoric story, will be located in manned visitor information centers.

Much of the information to be presented in the interpretive program will come from this report. It is reports such as this, which analyze technical data and present it in layman's terms, that make the study of prehistory interesting as well as educational.

R. J. Riebold, Forest Supervisor
Forest Service

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INTRODUCTION

During the winter of 1955-56 a snail shell midden, located in the Ocala National Forest and situated some distance from running water, was brought to the attention of the William L. Bryant Foundation by Frederick W. Sleight, then Director of the Central Florida Museum. The site appeared to be preceramic and hence to have respectable antiquity while presenting problems in dating and interpretation.

An archaeological investigation for the spring of 1957 was planned in which Sleight, Ripley P. Bullen, Curator of Social Sciences at the Florida State Museum, and William J. Bryant of the Bryant Foundation were to participate. Heavy rains over several years, which made the site practically inaccessible except on horseback, caused postponement until 1962 at which time Sleight was unable to participate in the field work. However, he arranged with the United States Department of Agriculture for the necessary permission to conduct archaeological explorations in the Ocala National Forest and for renewals of this permit until the completion of field investigation in 1964.

We appreciate the assistance given us by Messrs. L. S. Newcomb and R. J. Riebold, Forest Supervisors, and John Sieker, Director of the Division of Recreation and Land Uses, Forest Service, United States Department of Agriculture, for assistance in securing and renewing our work permit. We are also greatly indebted to Mr. Robert K. Dodson, District Ranger, Ocala National Forest, and his staff for location of sites, marking of trails, and transportation by water to Kimball Island.

Three similar sites were investigated. Bullen and Bryant collaborated in the original field work at each of the three sites but Bullen subsequently returned to the first two to secure material for additional radiocarbon tests. We are happy to include in this report a contour map of the Kimball Island site. It was compiled by H. Bruce Greene II, then of Winter Park, Florida, and is based on independent field work done by him and Carl A. Benson of Orlando, Florida.

GEOGRAPHICAL BACKGROUND

This report is concerned with attempts to date in terms of our calendar three fresh water snail shell middens located near the St. Johns River in the eastern part of the Ocala National Forest about 35 miles west of Daytona Beach, Florida. These sites are known as the Ocala National Forest Midden No. 1, Midden No. 2, and Midden No. 3 or Kimball Island mound (Fig. 1).

All three middens are large, consist almost exclusively of *Viviparus georgianus* Lea shells, and are situated at a substantial distance—about half a mile—from a river or lake where these shellfish might have been collected. Before describing these middens and our work at them, it seems desirable to briefly outline the environmental and archaeological situation in this part of the St. Johns River valley.

The St. Johns River flows northward some 160 miles until it turns towards the east at Jacksonville to leave Florida and join the Atlantic Ocean. Throughout this distance there are no falls or rapids and the total difference in elevation is only 20 feet (U. S. G. S. Deer Park S E quadrangle; Brown, Kenner, and Brown 1957: 32). Today the channel of the St. Johns appears to us to be stable but such has not been the case throughout recent geologic time. In places it is now maintained by dredging.

The valley of the St. Johns may be divided into three parts: an upper or southern third, a middle portion, and a northern or lower third. In the upper reaches, the St. Johns consists of a small, shallow, meandering stream draining a considerable swampy area. In this region there are no large springs and the size of the river is determined by rainfall. The northern end of this portion is at Lake Harney where the St. Johns River enters the eastern part of the lake region of Florida.

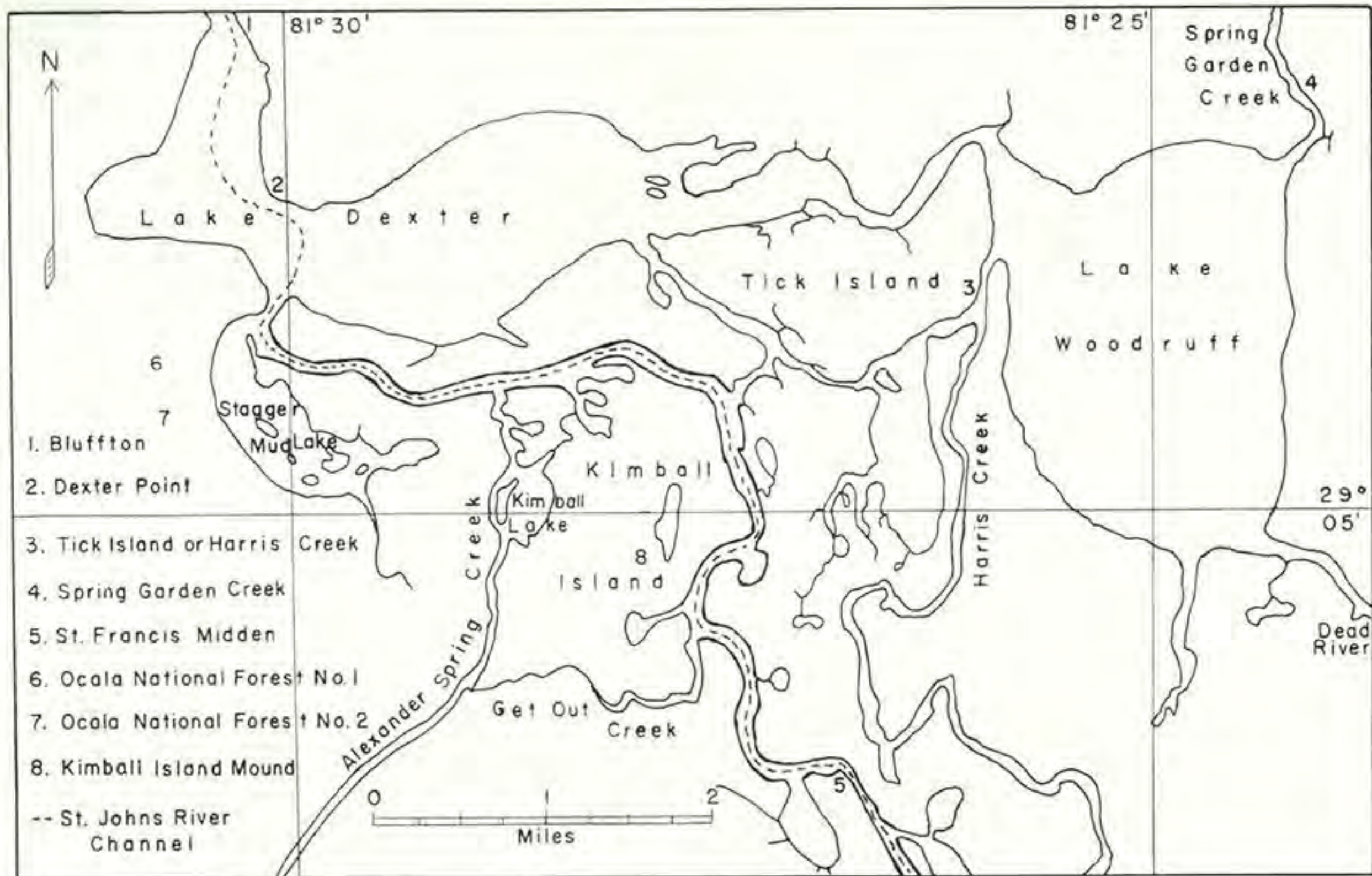


Figure 1. Map of part of the St. Johns River Valley.

In its mid portion the St. Johns River flows from Lake Harney via Lake Monroe, Lake Dexter, and Lake George to the northern end of the lake district a little south of Palatka. In this region it absorbs water from Lake Jessup, the Wekiva River, Lake Woodruff and DeLeon Springs, Alexander Springs, Salt Springs, the Ochlawaha River and Silver Springs, and Dunns Creek and Crescent Lake as well as from other minor streams and springs. Here the flow of the river is dominantly determined by water flowing out from a great many springs each with a different mineral content. The chemical composition of the water of the St. Johns is not only greatly modified as it passes through the lake region, it is varied with each new intake.

In this region, particularly south of Lakes Dexter and Woodruff, are to be found evidence of channel migration in the form of old "dead rivers," cutoff oxbows, and isolated lakes (Fig. 1). The western part of this extremely riverine region is included in the eastern part of the Ocala National Forest. It is in this area that our three midden sites are located (Fig. 1).

From Palatka northward the St. Johns, swollen by lake and spring water, flows slowly but majestically to the sea. Here the river is very wide and partakes of the nature of an estuary. Between Jacksonville and the ocean meanders and old channels are again in evidence.

A great many archaeological sites are to be found throughout the St. Johns River valley. Large sites pertinent to this report have been located in Figure 1. Four of them—Bluffton, Dexter Point, the Harris Creek midden on Tick Island, and the St. Francis midden—are extremely large and culturally similar. Typically such sites have lower extensive preceramic Archaic zones of the Mt. Taylor period (Goggin 1952: 40-43) producing stemmed points in reasonable quantities, sizeable intermediate fiber-tempered ceramic zones of the Orange period (Goggin 1952: 43-47, Bullen 1955), and higher but smaller zones of the St. Johns II period (Goggin 1952: 53-58, Bullen and Sleight 1960) producing St. Johns Check Stamped pottery. The post-Orange and pre-St. Johns II, Florida Transitional (Bullen 1959) and St. Johns I (Goggin 1952: 47-53, Bullen and Sleight 1960) periods are poorly represented. The Spring Garden Creek site is smaller than the others

and may not have a lower preceramic component but is otherwise similar.

These sites, as well as similar ones farther up and down the river, are composed of a mixture of small snail (*Viviparus georgianus* Lea), large snail (*Pomacea paludosa* Say), and mussel (*Unio* or *Elliptio* sp.) shells. There is a tendency for these shells to occur in alternating layers, but there is no "zone" exclusively composed of any one of these shells, nor can any one of them be said to be typical of the lower or of the upper levels. Radiocarbon dates indicate occupation at these sites before 2000 B. C., that the Orange period lasted from about 2000 B. C. to around 1000 B. C. (Bullen 1961) and that the beginning of the St. Johns II period occurred about A.D. 800 (Bullen and Sleight 1960).

FIELD WORK

Field work was started at Midden No. 1 on January 25, 1962, and at Midden No. 2 on February 27, 1962. About three days were spent at each site with a crew of four workmen. Transportation was by means of the Florida State Museum's 4-wheel drive Jeep which overcame deep sand, mud, and dense underbrush in getting the crew to the sites. The boat trip to Midden No. 3 occurred Feb. 19, 1963.

Midden No. 1

The location of Midden No. 1 is indicated on Figure 1. This midden is roughly oval in shape, some 80 feet wide, and about 150 feet long, with its major axis oriented in the north-south direction. It rises to a height of 13 feet above the surrounding land. The long western side is curved and gradual in slope compared with the eastern side which is noticeably straighter and steeper.

Midden No. 1 is situated at the western edge of the present flood plain of the St. Johns River. Here there is a slight rise in the elevation of the ground and a significant change in the flora. To the east the surface is level, damp, and sometimes eroded by shallow drainage sloughs. Overhead is a canopy of leaves which keeps out sunlight and, hence, prevents the growth of underbrush. Travel by foot is easy as vines and bushes are at a minimum. This flood plain is periodically inundated at times of high water which leaves behind a small amount of clay and sand.



Plate II. Excavating at Ocala National Forest Midden No. 1.

To the west of the edge of the flood plain, the land rises irregularly and is generally drier. Tree growth does not form a complete overhead cover and bushes and underbrush are a problem to the traveller. Gradually other plant associations become dominant.

Vegetation on the midden itself varies considerably from that of the surrounding flood plain. Not only does some sun penetrate to give encouragement to bushy growth but the alkalinity resulting from the shell composition of the midden is a determining factor in plant growth. Apparently, poison ivy does not suffer from over-alkalinity.

A 10- by 10- foot test, located near the highest point, was sunk in Midden No. 1. Results in terms of specimens are presented in Table 1. The top 30 inches of the midden was composed of a mixture of small snail shells (*Viviparus georgianus* Lea) and black dirt with some admixture of ash and heat-cemented shells. Mixed with the small snail shells were appreciable quantities of even smaller snails (*Goniobasis Floridanus* Reeve and *Helisoma scalare* Say). Samples of these shells were kindly identified by William J. Clench, Curator of Mollusks, Museum of Comparative Zoology,

Table 1
VERTICAL DISTRIBUTION OF SPECIMENS AT MIDDEN NO. 1

Specimens	Depths Below the Surface									
	Inches				Feet					
	0-6	6-12	12-18	18-24	2-3	3-4	4-5	5-6	6-7	7-8 8-10
St. Johns Plain	29	4	2							
Sand-tempered plain	6									
Orange Plain	1		1							
Pecked sandstone disc	1									
Strumbus celt	1									
Fragments, conch shell		1			1					
Fragments, bone pins or awls	1	1			6	3				1
Concentration of animal bones	x	x			x	x				x
Basally-notched point			1							
Stemmed point			1							
Tip of a point				1						
Flake-scraper				4	4	1				
Unused chert chips	1			1	2	3		1		

Harvard College, Cambridge, Massachusetts (letter of Feb. 7, 1962).

At a depth of about 30 inches below the surface we encountered a compact zone of heat-cemented shells, approximately 3 inches thick, over all the excavated area. Associated with these cemented shells was a considerable quantity of ashes. Below this level down to a depth of 50 inches the deposit, as before, consisted dominantly of *Viviparus* shells with the usual admixture of some *Goniobasis* and *Helisoma* shells. Large snail (*Pomacea* sp.) and mussel (*El-liptio* sp.) shells represented much less than .1 per cent of the total volume. The presence of numerous small fish bones was noted. At about 50 inches below the surface another zone of cemented shells, 3 to 5 inches thick, was met.

Our test continued downward to a depth of 10 feet but, of course, the excavated areas became smaller as it was impossible to maintain vertical walls in the loose snail shell deposit. Lower levels were much the same as higher levels except that we encountered a little more ash and a relatively greater quantity of fish bones. At a depth of 7.5 feet a small, charcoal-impregnated zone divided the lower deposit into two parts. Just below this zone, in the 8- to 9-foot level, we noted a concentration of deer and turtle bones. Throughout this test *Viviparus* shells consisted of 99 per cent of the volume of the midden.

Ten feet west of the apparent edge of the midden, we made a small test which disclosed a profile from the surface downward of 6 inches black dirt, 17 inches shell and grey sand, and then sterile grey sand. Fifty feet further to the west, we made another small test. There the black dirt was 10 inches thick and rested directly on the grey sand. Apparently, this is the normal profile. The underlying gray sand is medium fine and seemed to contain a little clay.

Subsequently, on April 7, 1964, the senior author accompanied by C. J. Clausen, then a graduate student at the University of Florida, returned to Midden No. 1 to secure a sample of *Viviparus* shells for radiocarbon dating. Removing the top 9 inches, the sample was taken from between depths of 9 to 16 inches in a location 3 feet west of the test described above. Results of radiocarbon analysis of this sample known as Sample M (Isotopes, Inc. No. I-1345) will be discussed later. In collecting this sample a broken

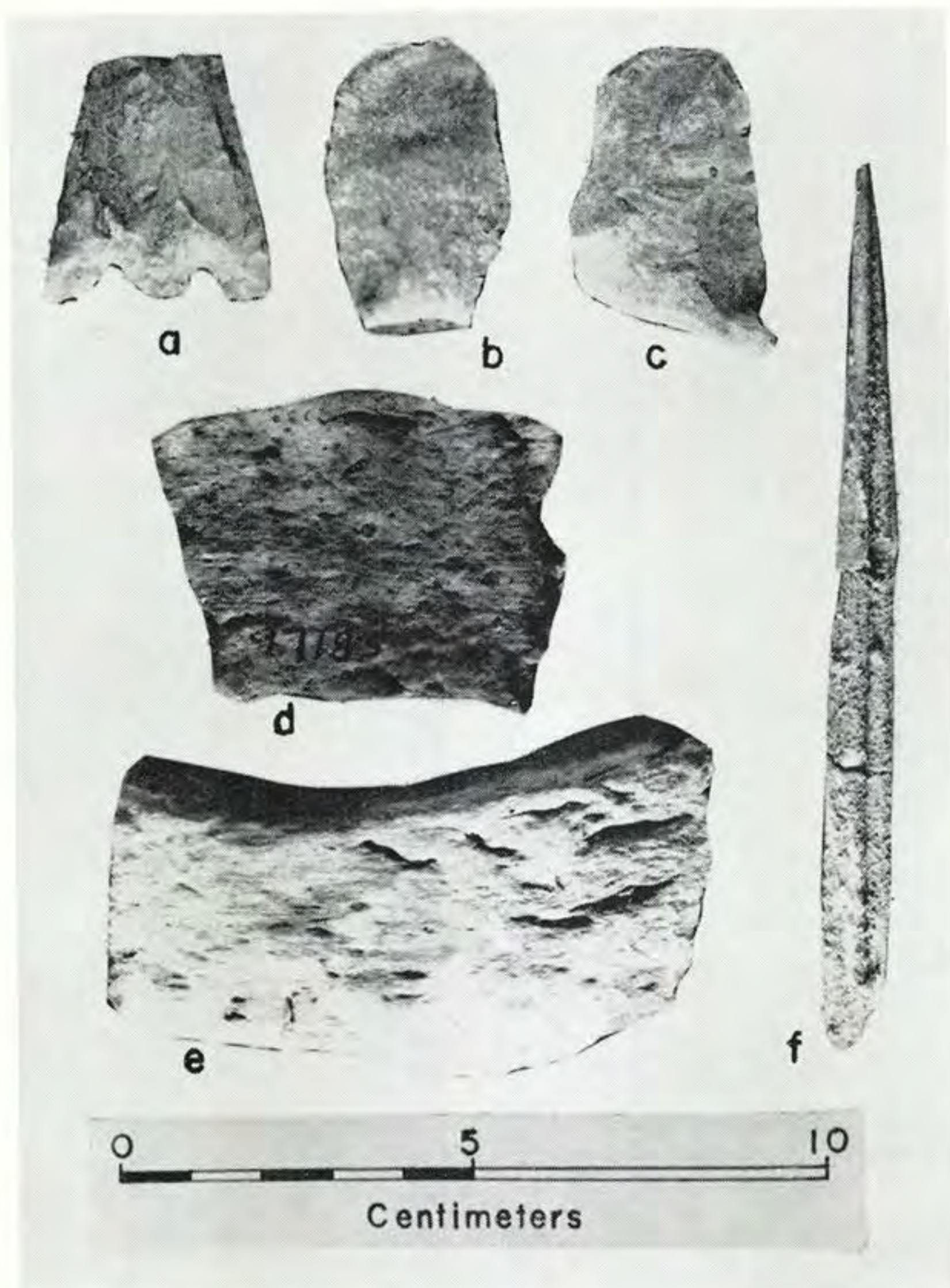


Plate III. Specimens from Ocala National Forest Midden No. 1.
a, basally notched point; *b-c*, flake-scrapers; *d-e*, St. Johns Plain sherds;
f, long bone point.

stemmed point and a sherd of St. Johns Plain pottery were found. The latter was about 5 inches below the surface.

Specimens from the main test at Midden No. 1 are listed by arbitrary levels in Table 1. Three quarters of the St. Johns Plain sherds (Pl. III, *d-e*) are soft and exhibit occasional red pieces of sherd temper. The balance are similar but contain both sherd temper and fine sand in small quantities. The sand-tempered sherds contain a large amount of white quartz sand as temper.

The basally-notched point is intermediate between a Hernando and a Citrus point (Bullen and Bullen 1963: 89-90). Other specimens merit no special comment except for what we have designated "flake scrapers" (Pl. III, *b-c*). These tools are made intentionally from small, thin flakes by steeply chipping one edge by the removal of minute bits of chert.

The vertical arrangement in Table 1 suggests the anticipated culture sequence for the region: a preceramic Mt. Taylor period followed by the Orange period with fiber-tempered pottery and then by a period when St. Johns ceramics became dominant. Whether the highest levels represent a St. Johns I period or one transitional between the fiber-tempered and chalky ceramic epochs is debatable. The lack of any substantial Orange period deposit separates this site from the large shell heaps typical of the St. Johns River. These matters will be discussed further in the concluding phase of this paper.

Examination of Table 1 indicates three zones in which specimens and food bones concentrate: near the surface, around a depth of 3 feet, and between depths of 8 and 9 feet. Unfortunately we have no specimens to define the material culture of the Indians who ate the contents of the shells of the lowest zone.

Animal food remains included bones of deer, turtle, fish, and racoon and appeared to be the same as those listed later for Midden No. 2. While deer bones were found in fairly equal numbers down to a depth of 4 feet and again between depths of 8 and 9 feet, turtle bones were limited to the three zones of concentration mentioned above.

As Midden No. 1 is today remote and difficult of access, it is of interest to note the fragments of marine shells found at depths of 6 to 12 and 24 to 36 inches. Communication may have been easier and the site less isolated many years ago.

Midden No. 2

Midden No. 2 is located about a half mile south of No. 1 (Fig. 1). The environmental situation is exactly the same for both middens. A small brook or slough flows towards the east about midway between the two middens. Much the larger, Midden No. 2 is approximately 380 feet long, about 100 feet wide, and 15 feet high. Oriented with its major axis extending in a north-south direction, the east side has a gradual slope with irregular shape and surface contours while the west side is rather straight and steep.

Our test, 10 by 20 feet in size, was located a little south of the center of the midden as roots of large trees made excavation difficult farther north. The vertical position of specimens is given in Table 2 and the locations of samples taken for radiocarbon dating are indicated on the west profile (Fig. 2).

As shown by our test, 98 per cent of Midden No. 2 consisted of small snail (*Viviparus*) shells. Compared with Midden No. 1, large snail and mussel shells, while not common, were more frequently encountered, especially at lower depths. The same was also true of ashes and heat-cemented shells. As before, some very small snail shells (*Goniobasis* and *Helisoma*) were present in small but noticeable quantities.

By the time the excavation had reached a depth of 8 feet, our trench was reduced to an area 6 by 4 feet in size. We were able to get down to 10 feet below the surface without difficulty although our hole became of necessity still smaller. Below that depth we were unable to dig and maintain levels because of the looseness of the shells. Every shovel full was immediately replaced as soon as it was removed. Our maximum penetration was to a depth of 11.5 feet. We regret that we were unable to reach the base of Midden No. 2. It is doubtful if the knowledge to be gained would have merited the substantial enlargement of our test.

This fairly homogeneous deposit was divided vertically into several zones as shown in Figure 2. Between depths of 30 to 36 inches was a thick layer of cemented shells, charcoal, and black sand. Charcoal from this level formed our radiocarbon sample "F." At a depth of 5 feet we uncovered what appeared to be a hearth, 6 by 2 feet in size, composed of cemented shells. Charcoal in large quantities was not present. At 8 feet was another zone of

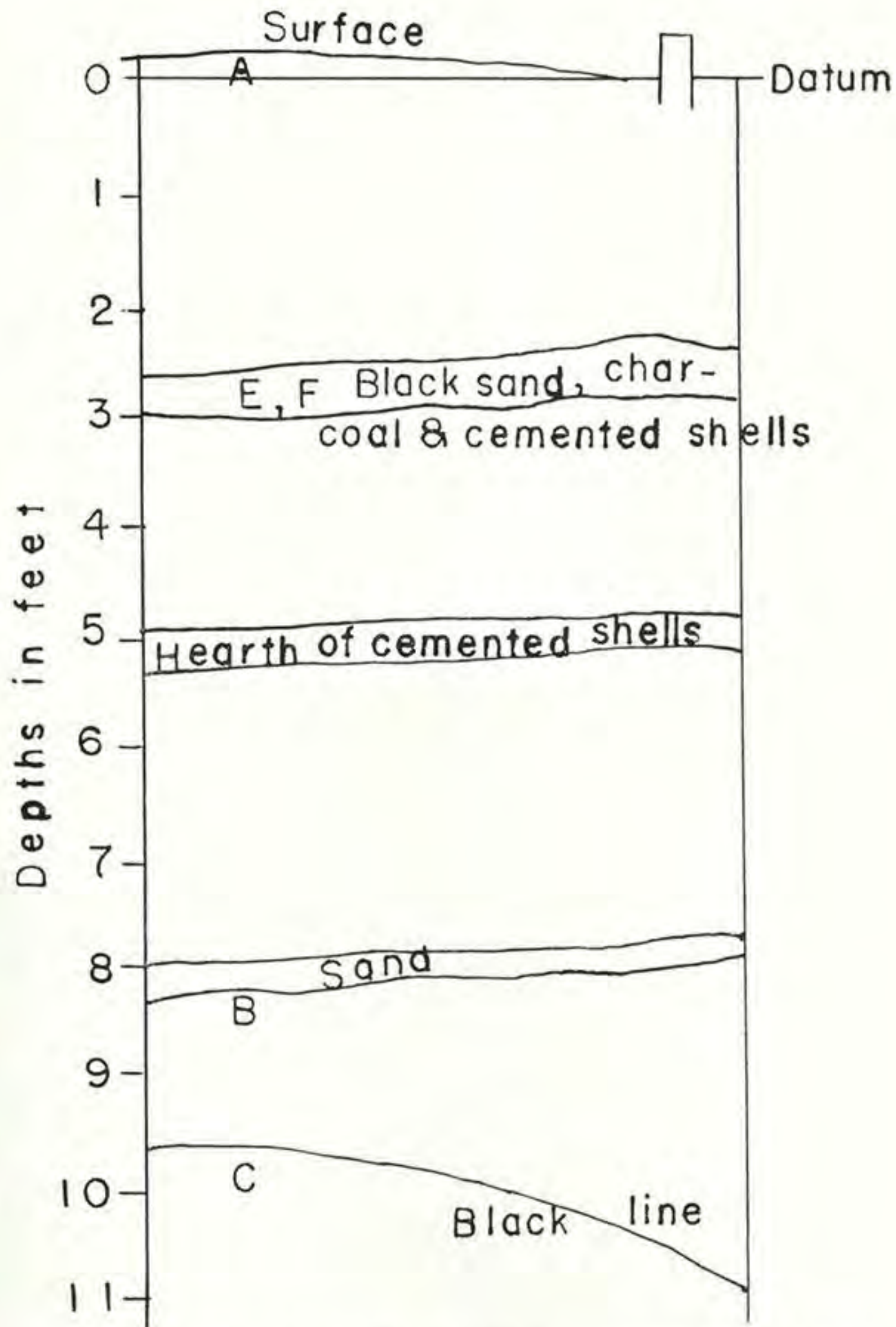


Figure 2. Section of west profile, Ocala National Forest Midden No. 2.

heat-cemented shells on top of which Indians had deposited a large amount of clean sand. Radiocarbon sample "B" was collected from just below this layer of cemented shells. Sloping downwards between depths of 9.5 and 11 feet (Fig. 2) was a narrow dark line of burnt mussel shells. Our lowest radiocarbon sample, Sample C, came from below this line. Apparently, shells in this part of our trench collected rapidly as radiocarbon tests of Samples B and C did not indicate a different age.

As shown in Table 2 the only sherd of pottery we discovered in our trench came from the first 6-inch level. To check further the ceramic picture of Midden No. 2, we dug a series of nine small tests. Three of these, each 2 feet in diameter and 18 inches deep, were located in the central and northern part of the top of the midden. They were sterile. The fourth, 2 by 2 feet in area, was located a little further to the northeast in a small level area about 2 feet lower than the top of the midden. This test produced two St. Johns Plain sherds. The other five tests, all 2 by 2 feet and located at presumed to be strategic spots at lower elevations around the midden, were sterile. We decided that any use of this midden



Plate IV. Ocala National Forest Midden No. 2 during excavation.

during ceramic periods must have been very superficial. Sherds at Midden No. 2 were both less common and shallower in proveniences than at Midden No. 1.

The one St. Johns Plain sherd from our main test at Midden No. 2 was, like the two mentioned above, similar to those from Midden No. 1 (Pl. III, *e*). Other specimens listed in Table 2 include bone and stone tools and animal food bones.

A peg-topped bone pin (Pl. V, *i*) was found in the 12- to 18-inch level. Six fragments of bone points (Pl. V, *f-g*) were located between depths of 18 and 36 inches. Five bone awls (Pl. V, *d-e, h*) were concentrated between depths of 2 and 4 feet. Pieces of worked bone had general distribution above a depth of 5 feet. The number of bone specimens greatly exceeded those found in Midden No. 1.

Only one flake-scraper, like those found in Midden No. 1 (Pl. III, *b-c*), came from Midden No. 2. Its relatively higher provenience, in the 6- to 12-inch zone as opposed to the 18- to 48-inch zones, agreed with the scarcity and shallowness of pottery in suggesting the highest levels of Midden No. 2 were older than the corresponding levels of Midden No. 1.

Other stone specimens from Midden No. 2 included two drills or perforators (Pl. V, *a-b*) and a stemmed point (Pl. V, *c*), all from the highest foot of the midden. A piece of sandstone from the 18- to 24-inch level completed the stone inventory.

Table 3

IDENTIFIED ANIMAL REMAINS FROM OCALA NATIONAL FOREST
MIDDEN NO. 2

Mammal	rabbit	<i>Sylvilagus</i> sp.
	raccoon	<i>Procyon lotor</i>
	white-tailed deer	<i>Odocoileus virginianus</i>
Amphibian	siren	<i>Siren lacertina</i>
Reptile	musk turtle	<i>Kinosternon</i> sp.
	box turtle	<i>Terrapene carolina</i>
	terrapin	<i>Pseudemys</i> sp.
	soft-shelled turtle	<i>Trionyx ferox</i>
Fish	gar	<i>Lepisosteus</i> sp.
	bowfin	<i>Amia calva</i>
	redeer sunfish	<i>Lepomis microlophus</i>

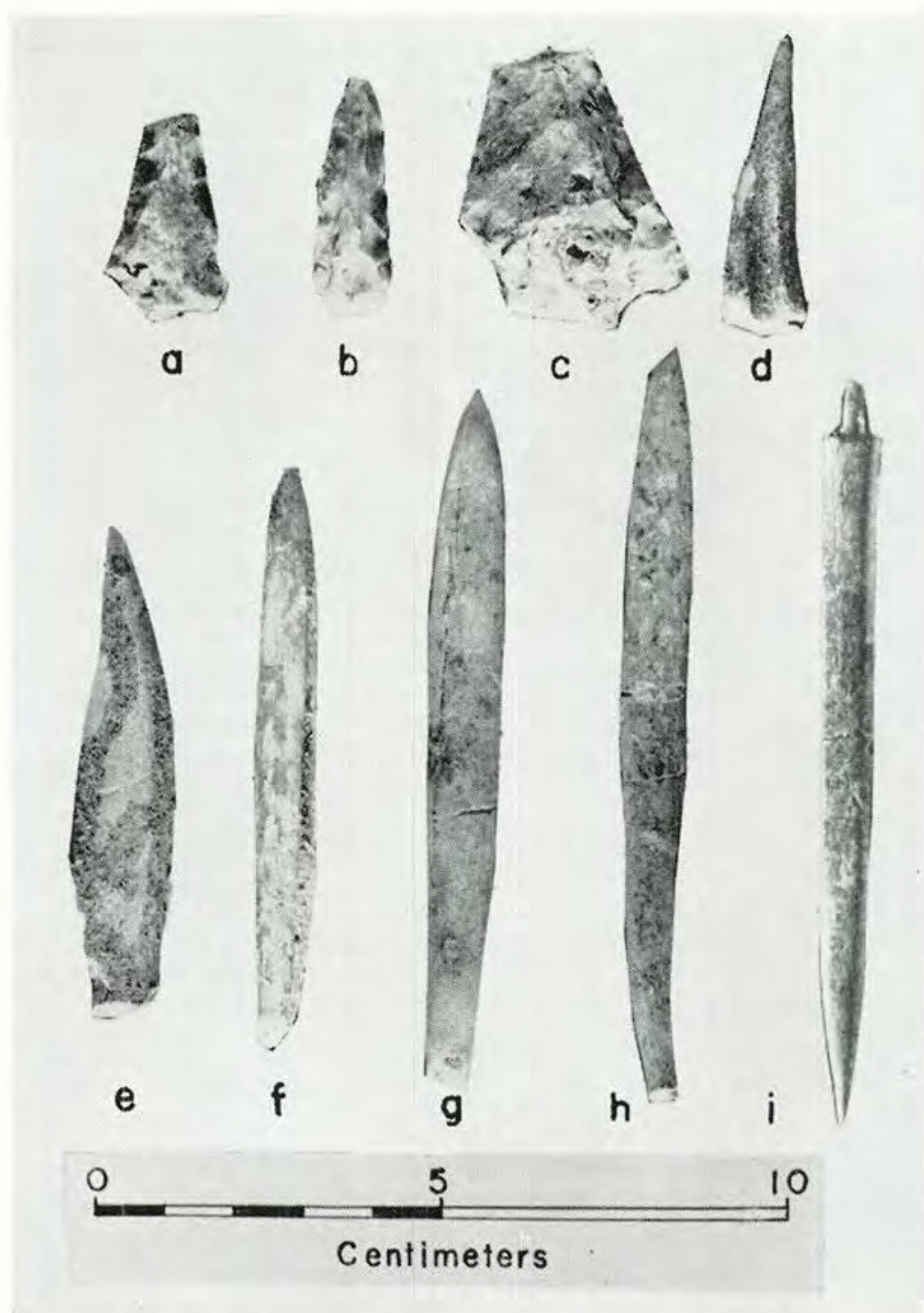


Plate V. Specimens from Ocala National Forest Midden No. 2.
a-b, stone drills or perforators; *c*, stemmed point; *d-e*, bone awls; *f-g*, long bone points; *h*, long bone awl; *i*, peg-topped bone pin.

Food bones were evenly distributed throughout our test except for the heavy concentration around a depth of 30 inches, where they were associated with the thick layer of cemented shells and charcoal found at that depth. The above list of the animals represented by those bones has been prepared by Elizabeth S. Wing, Assistant Curator of Zooarchaeology, Florida State Museum.

After the results of the first radiocarbon tests were received and it was decided to run shell samples from Midden No. 2, we realized we had neglected to get a sample from the top of our section. The senior author consequently returned, accompanied by Howard A. Chamberlen, Museum Technician at the Florida State Museum, and Morgan MacLachlan, then a graduate student working at the Museum, and collected a sample at a depth of 6 inches from undisturbed shell adjacent to our trench. It became known as Sample A.

The Kimball Island Midden

Usually referred to as the Kimball Island Midden or Mound, Midden No. 3 (Fig. 1, 8) is more remote than either of the others. Under the right water conditions and with a good guide and boat, the trip is very pleasant. We were taken up Alexander Spring Creek and across 1-foot deep Kimball Mud Lake to the western side of Kimball Island (Fig. 1). From there it was only a short walk to the midden. This was the same route as that used by Greene and Benson when they surveyed the midden and collected the data for their contour map of the mound (Benson and Greene 1962: 113). This map, a copy of which was kindly given by them to us, has been reduced and presented here as Figure 3.

The surface of Kimball Island is only a foot or two above that of the surrounding water. The midden is divided into two ovate areas. The smaller, to the northwest, is also the lower in altitude as it rises to a height of only 13 feet while the two high points in the larger area, towards the southeast, both reach 17 feet above the surrounding land. The Kimball Island midden is considerably larger in area than either of the other two sites previously discussed. The contour lines may be interpreted as suggesting that a group of four huts were located at the site.

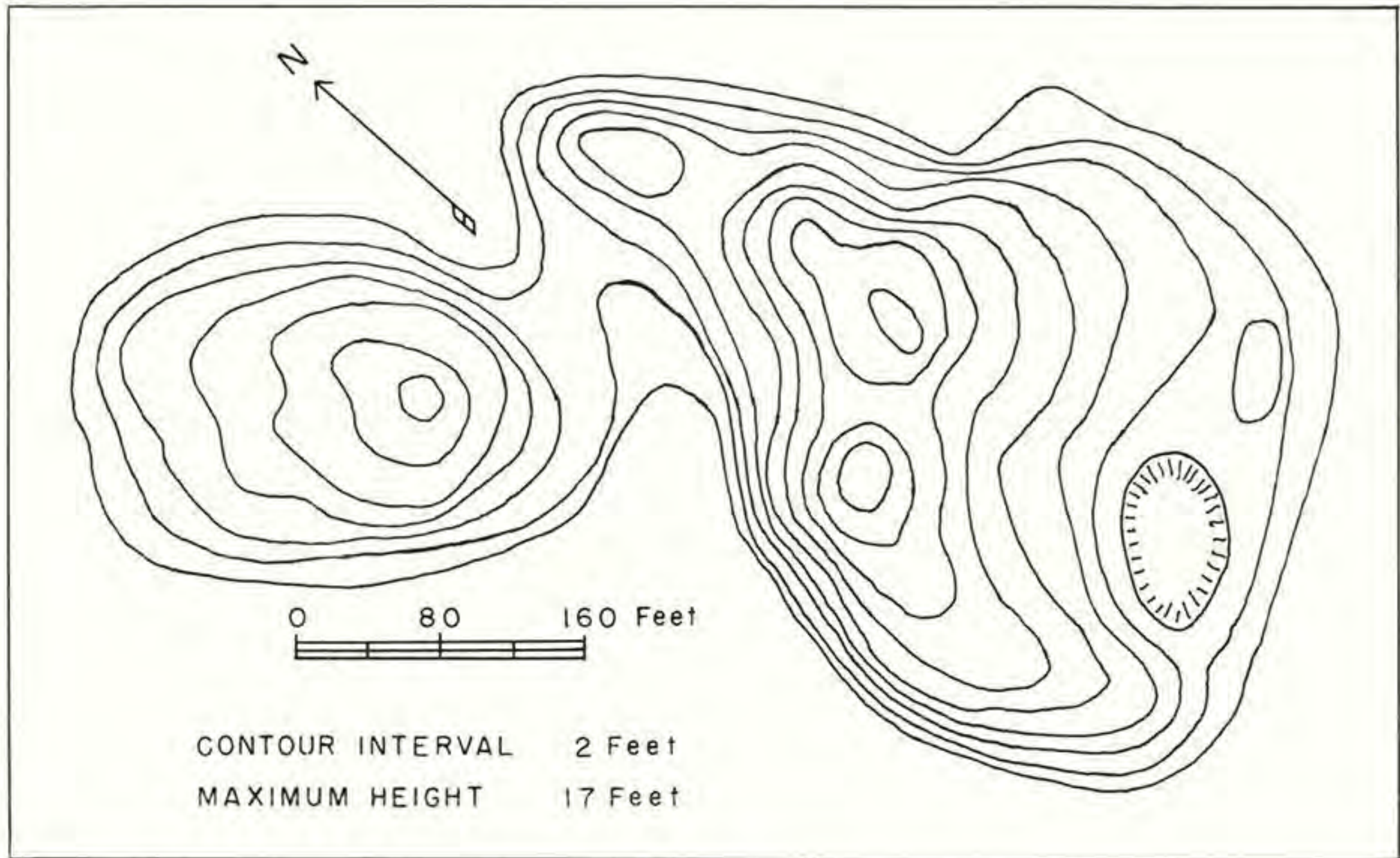


Figure 3. Contour map of Kimball Island Midden.

Our examination revealed that while dominantly formed of small snail (*Viviparus*) shells, more large snail and mussel shells were present than at the other sites. The presence of several "pot-hunters" holes gave us an idea of the internal structure of the shell deposits. While similar to those at the other middens, more dirt seemed to be present and in one place a sand zone was noted.

Examination of the surface, of pot-hunter's spoil piles, and of the edges of their holes failed to disclose any pottery. Benson and Greene during the three days they worked at the site—two days surveying, one day testing the strata—found only three sherds. These, two St. Johns Plain and one St. Johns Check Stamped, were in the first 6-inch levels of several pits (Benson and Greene 1962: 114). Pottery was as scarce at Kimball Island as at Midden No. 2.

Along the steep western side of the midden and in the curved area between the two lobes of the site, the surface seemed sunken as if a ditch had been present. One is tempted to see here the remains of a cutoff oxbow, now nearly filled up, in which shells may at one time have grown. Alternatively, this depression may be the remains of a creek.

Examination of the air photo of the Kimball Island region at the United States Agricultural Stabilization and Conservation Service office in Gainesville, Florida, indicates a "slough" extends from the southern end of the lake, located to the northeast of the site, southwesterly to the "bay" located below the "n" of the word "Island" (Fig. 1). The Kimball Island mound is not on this slough but the depression mentioned above may have been a connecting creek. Years ago the site on Kimball Island may have been more accessible to shellfish producing waters than is the case today.

The Kimball Island mound is so similar to the other middens covered by this report that it seems likely it was occupied contemporaneously by the same or culturally similar people.

DISCUSSION AND DATING

Our investigations indicate there is a series of sites in and along the edge of the St. Johns River flood plain which have certain consistent characteristics. While these investigations were

limited to three sites, it is believed other with the same characteristics could be located with additional field work. At least we have heard comments of hunters and others which suggest the existence of similar sites.

Midden No. 1, Midden No. 2, and the Kimball Island midden are all located at a substantial distance from water, are dominantly composed of small snail shells with only a trace of large snail or mussel shells, contain sand zones, and do not produce pottery in large amounts. At Midden No. 2 and Kimball Island the sherds found were both few in number (a total of six St. Johns Series sherds) and limited to the top 6 inches. We feel they can easily be accounted for by casual use of the sites by campers during the St. Johns period. We conclude that these two middens may be considered as having been entirely built during the Mt. Taylor or preceramic part of the Archaic period. This would indicate abandonment before the introduction of fiber-tempered ceramics or before 2000 B.C.

At Midden No. 1 the situation was different. There St. Johns Plain sherds were found in fair quantities (Table 1). While concentrating in the highest zone a few were found as deep as 12 to 18 inches. Use of the site during the Orange period (2000-1000 B.C.) is suggested by two Orange Plain sherds (Table 1). Whether the Orange period is represented by deposits between depths of 6 and 18 inches or whether deposits of that period extend deeper is not certain from our limited test. Certainly the lower levels of this midden must be considered preceramic in date.

Midden No. 1, then, was started during the Mt. Taylor period, occupied during at least part of the Orange (or Transitional) period, and used for habitation in the early part of the St. Johns I period. This sequence is similar to that at the large middens along the present or recent channel and lakes of the St. Johns River such as Bluffton, Dexter Point, Tick Island, and St. Francis (Fig. 1). It seems reasonable to equate Midden No. 1 temporally with the early and middle parts of these St. Johns River middens. The latter sites contain St. Johns Check Stamped pottery in the highest zones indicating use in the St. Johns II period. Occupation at Midden No. 1 did not last that late.

We believe that all of Midden No. 2, all of the Kimball Island midden, and the lower part of Midden No. 1 are culturally and

chronologically the equivalent of the lower, preceramic zones of the St. Johns River sites while the upper part of Midden No. 1 equates with the middle period of the St. Johns River middens. These correlations should be reflected in radiocarbon dates.

It should be emphasized that the only difference between the composition of the Ocala National Forest sites and that of the preceramic layers of the St. Johns River sites lies in the fact that the former are composed almost exclusively of small snail shells while the latter also contain large quantities of large snail and mussel shells.

While excavating at Midden No. 2, the point was forcibly brought to our attention that we would gain very little information from the artifacts we were (*not*) finding that would be useful in reconstructing life at the site or in dating the deposits other than as preceramic. The lack of other than small snail shells suggested a local environment different from that of the St. Johns River proper. Perhaps, if we could gain some idea of the length of time it took for the midden to accumulate, it would help to eliminate one of the unknowns in population estimates. Radiocarbon dating of the shells should give us temporal differences between the top and the bottom of the midden and tell us when occupation had occurred in terms of our calendar. At the time of excavation no radiocarbon dates were available for the preceramic part of the Florida Archaic period. To this end we collected samples of *Viviparus* shells.

To secure a sample of recent *Viviparus* shells for a test to find out if such shells when growing in limestone waters were contaminated by antique carbon, Bullen on March 2, 1962 went down Spring Garden Creek (Fig. 1) from DeLeon Springs to a place where he remembered seeing *Viviparus* shells. Specimens were collected from around and near the roots of a tree uprooted by Hurricane Donna in 1960. These specimens were dead but some of the skin was present and it was presumed they had not been dead very long.

When this matter was discussed with Isotopes, Inc., Westwood, New Jersey, they felt that the "recent" shells from Spring Garden Creek might have been contaminated by bomb fallout C-14 and asked if at all possible, that we secure shells collected at least 15 years ago. A check of the research collections of the Florida State

Museum disclosed a few *Viviparus* shells (Lot No. 4492) collected in 1938 from the north shore of Lake Monroe, 2 miles west of Sanford, Florida. Not realizing at the time the extreme variation in the chemical content of the water in the St. Johns River, some of the Lake Monroe shells were sent to Isotopes, Inc., to serve as a modern standard. In the same shipment went charcoal we had collected from a depth of 33 inches in Midden No. 2.

These samples are known as Samples G and F respectively and the results of their radiocarbon runs are given in Table 4 which also includes the results of tests on our other samples. The charcoal, Sample F, gave a date of about 2775 B.C. which seemed reasonable as it was comfortably earlier than the date for the introduction of pottery (2000 B.C.). When secured in 1962, this was the earliest Florida Archaic radiocarbon date. As the Lake Monroe *Viviparus* shells proved to contain 98.7 per cent of the C-14 activity of the National Bureau of Standards oxalic acid standard and to yield a date equal to or less than 85 years B.P., we decided to continue our efforts to date Midden No. 2 by dating the shells which formed it.

Samples A, B, and C were sent to Isotopes, Inc., and dated. The results—4500 B.C., 5450 B.C., and 5300 B.C. (Table 4)—had a certain amount of internal consistency but differed considerably from the date (2775 B.C.) previously secured from the charcoal sample, Sample F, which was stratigraphically located between Samples A and B. Assuming the charcoal date to be approximately correct, our modern sample from Lake Monroe was not a proper standard for the shells from Midden No. 2. In other words the environment in which they grew differed considerably from that of Lake Monroe.

This led us to a consideration of the chemical content of the waters feeding the St. Johns River. Some of the available analyses are presented in Tables 5-7. In order to correlate the dates from Midden No. 2 with our calendar we had a test run on *Viviparus* shells (Sample B) from the same zone as the previously tested charcoal sample (Sample F). To test the effects of an extreme limey environment on *Viviparus* shells we also had the sample from Spring Garden Creek (Sample D) tested.

These runs gave the expected result. Sample E from the 33 inch depth of Midden No. 2 produced a date nicely intermediate between

Table 4
RADIOCARBON DATES

Bryant-F.S.M.	Isotopes, Inc. number	Material	Provenience	Before Present date	Approximate calendar date	Adjusted date
G	I-564	Viviparus shells	Lake Monroe	≤ 85	present	—
D	I-684	Viviparus shells	Spring Garden Creek	4300 ± 175	2350 B.C.	??
A	I-634	Viviparus shells	Midden No. 2 6 inch depth	6450 ± 250	4500 B.C.	2225 B.C.
E	I-683	Viviparus shells	Midden No. 2 33 inch depth	7000 ± 250	5050 B.C.	2775 B.C.
F	I-563	charcoal	Midden No. 2 33 inch depth	4725 ± 180	2775 B.C.	2775 B.C.
B	I-635	Viviparus shells	Midden No. 2 8.5 foot depth	7400 ± 250	5450 B.C.	3175 B.C.
C	I-636	Viviparus shells	Midden No. 2 10 foot depth	7250 ± 250	5300 B.C.	3025 B.C.
H	I-1345	Viviparus shells	Midden No. 1 12 inch depth	3640 ± 110	1690 B.C.	—

Table 5
SOME BICARBONATE VALUES FOR THE ST. JOHNS RIVER
(parts per million)

Location of samples	Dates of samples		
	June 7, 1962	July 7, 1962	Aug. 15, 1962
At entrance to Lake Monroe (Highway 415)	66	66	46
At exit from Lake Monroe (Highway 17)		96	68
At Crows Bluff (Highway 44)	152	129	80
At Astor Park (Highway 40)	116	102	—

those from Sample A (6 inch depth) and Sample B (8.5 foot depth). The date from Sample D from Spring Garden Creek, 2350 B.C., indicated contamination by antique carbon but was nowhere near as old as those from the presumed substantially older shells of Midden No. 2 (Table 4).

We believe that the difficulties encountered in dating these *Viviparus* shells are caused by variations in the environments in which they grew, which we interpret to be differences in the percentages of carbonates containing antique carbon present in the water. Springs in the lake region of Florida emit water which comes from an aquifer composed of Eocene limestones. Carbonates in this water (Brown, Kenner, and Brown 1957) must contain antique carbon which would dilute the radiocarbon activity of carbonates (HCO_3 or CO_2) of any body of water into which such springs flow. The resultant effect, of course, would be a question of relative volumes and percentages. Radiocarbon analyses of organisms living in such water and securing their carbon from the carbonates in these waters would be expected to produce abnormally old dates.

Recent bicarbonate values (HCO_3) for four locations on the St. Johns River are given in Table 5. Month to month variation is evident. Data taken at one location near DeLand on the St. Johns River over 1948 and 1949 show that these carbonates are two to three times as plentiful in the summer, when the river temperature is high, as in the winter, when the temperature of the water is low. These data were kindly given us by Kenneth A. MacKichan (letter

of Sept. 19, 1962), District Engineer, Quality of Water Branch, United States Geological Survey, Ocala, Florida. If shellfish should grow more rapidly in the summer than in the winter the effect would be cumulative.

We do not understand why the HCO_3 values increased between the entrance and exit of the St. Johns River at Lake Monroe, but clearly the lowest value is that given for Lake Monroe (Table 5). The increase between Lake Monroe and Crows Bluff reflects the entrance of water from Wekiva and Rock Springs, sources high in HCO_3 . Our *Viviparus* sample from this lake, as was the case, would be expected to give a radiocarbon date more nearly correct in terms of our calendar than would samples from farther down the river where the content of carbonate containing antique carbon is greater. The north shore of Lake Monroe is not on the direct line of river flow. Possibly our sample, which came from that shore, may have been growing in a location where the concentration of antique carbon was relatively low.

Available bicarbonate and calcium carbonate values at various points on the St. Johns River for a three day period in 1954 (Brown, Kenner, and Brown 1957: 94-110) are given in Table 6. The table is arranged downstream from south to north. The increase in these values below Christmas is very evident as is the large variation from collecting station to collecting station. Our sites are located off the river but between Crows Bluff and Astor where the highest HCO_3 values are indicated. These values reflect the addition to the St. Johns River of water from different tributaries many of which originate in springs. In order to show the variation in the waters from these springs, partial analyses of the principal springs feeding the St. Johns River have been given in Table 7 (Ferguson, *et al.* 1947: 119-67). It is evident that the micro-environment of growing shells in this area is very critical in regard to the availability of antique carbon.

We do not know the source of shells forming Midden No. 2, nor is there any way of ascertaining it. Because of the internal consistency in dates, it seems likely all the shells from this midden came from the same source. Sample H from Midden No. 1 differs considerably in its date (Table 4) from any of the *Viviparus* dates from Midden No. 2. It seems likely shells of Midden No. 1, at

Table 6
BICARBONATE AND CALCIUM CARBONATE VALUES FOR
THE ST. JOHNS RIVER
(parts per million)
May 17-19, 1954

Station	HCO ₃	CaCO ₃	Station	HCO ₃	CaCO ₃
Near Malabar	33	34	Near Mims	76	1240
Near Melbourne	18	29	Near Geneva	48	320
Near Bonaventure	28	36	At Osceola	38	265
At Lake Winder	26	41	At Lake Jessup	43	246
At Lake Poinsett	42	81	At Lake Monroe	64	220
Near Delespine	22	88	Near Sanford	58	202
Near Christmas	35	130	At Crows Bluff	94	204
At Kyser Ranch	66	573	At Astor	93	212

least those from the top of that midden, came from a different environment than did the shells of Midden No. 2.

Sample D from Spring Garden Creek grew in water from Ponce de Leon Springs which is one of the higher contributors of antique carbon into the St. Johns River system (Table 7). When we collected this sample, we thought the shells composing it had only very recently died. Greater knowledge of the habits of *Viv-*

Table 7
BICARBONATE AND CALCIUM CARBONATE VALUES FOR SOME
FLORIDA SPRINGS
(parts per million)
All flow into the St. Johns River

Springs	HCO ₃	CaCO ₃	CO ₂		HCO ₃	CaCO ₃	CO ₂
Seminole County				Lake County			
Sanlando	125	105	13	Alexander	98	176	20
Sheppard	141	126	—	Marion County			
Orange County				Salt	87	1290	
Rock	105	107	—	Silver Glen	85	406	—
Kekiva	117	94	—	Silver (near			
Volusia County				Ocala)	201	209	
Blue	148	399	6				
Ponce de Leon	130	340	—				

parus shells sheds some doubt on that assumption. These shells were exposed by the roots of a tree blown down by hurricane Donna, but if alive at the time the tree blew down they must have been living "in" instead of "on" mud. It seems likely they were washed in a dead state onto a mud flat—or died on the flat—to be then covered with more mud and to be later exposed when the tree blew down. They thus would predate the growth of the tree. While we cannot tell the exact origin of these shells, their extremely old date (2350 B.C.) certainly reflects their growth in Spring Garden Creek, an environment abounding in antique carbon. Parenthetically, there is no preceramic midden on Spring Garden Creek from which the shells of Sample D could have washed.

There are some references in the radiocarbon literature to dates on contemporary shells which were 1350 to 1800 years older than present (Crane and Griffin 1959: 176-77). There is also a note in *Radiocarbon Supplement* (Vol. 4: 46-48) under the Kincaid Shelter series that "all dates from the same excavation units are in proper sequence. Dates on charcoal are for the most part reasonable, while dates on snail shells are older than expected." This seems to match our experience.

In 1964 in an article in *Science*, Broecker discussed the problem of C-14 and C-13 deficiencies in lake and river mollusks and decided that "solution of carbonate rocks can be conclusively demonstrated to be a major source of dissolved carbon and an entirely adequate source of the observed C-14 deficiency." Our findings would support Broecker's conclusions.

The investigation reported here is not a quantitative study of the effects of antique carbon on *Viviparus* shell radiocarbon dates. We hope others will collect live samples from spring waters of different composition and from river and lake waters of known low concentrations of carbonates. Radiocarbon runs on such samples should indicate quantitatively the relationships between B.P. dates and the percentages of carbonates and, hence, antique carbon present.

This brings us to the question of the dates for Middens No. 1 and 2. As shown in Table 4, we have assumed that the radiocarbon date from the charcoal (Sample F) from the 33 inch zone at Mid-

den No. 2 is approximately correct. The date for *Viviparus* shells associated with this charcoal was greater by 2275 years. Assuming this difference to be the correct adjustment, we have subtracted 2275 years from the other *Viviparus* dates for Midden 2 to get the adjusted dates shown in the last column of Table 4. Archaeologically, these dates are, if anything, conservative. They indicate the abandonment of Midden No. 2 around 2225 B.C. or over 200 years before the introduction of fiber-tempered pottery. This is a reasonable correlation as no pottery was found in Midden No. 2.

Dates for the basal part of the midden, but not the bottom, are around 3100 B.C. This suggests Indians started living at the site around 3200 B.C. and continued—possibly intermittently—living there until about 2200 B.C. or that it took about 1000 years for Midden No. 2 to accumulate. Again this seems reasonable. This implies that a small group, not more than one extended family, lived at the site for a long time. Such a small group living in balance with the local ecology seems more likely than that the midden represents the accumulation of a large group who, in a short period of time, might be expected to kill off shellfish by over collecting.

We have only one date for Midden No. 1. This date, around 1690 B.C., came from a depth of about 12 inches. As shown in Figure 1, this depth could represent an early St. Johns I (circa A.D. 0-500), a Transitional (circa 750 B.C.), or an Orange (2000-1000 B.C.) period. If the date were to be taken as indicated, it would fit nicely at about the middle of the Orange period. If the date reflects the presence of some antique carbon, as is likely the case, it might fit either of the other two periods mentioned above.

We feel there is plenty of evidence, as mentioned earlier, to believe that the channel of the St. Johns River has not been constant over thousands of years (Fig. 1). It seems to us likely that both Midden No. 1 and No. 2 were located on one or more oxbows of the river when first settled by Indians. If the oxbow became cut off from the main channel, *Viviparus* shells would continue to grow and, hence, the Indians would not have to move as their dominant food supply would still be present. Over a long period of time, flood waters would leave enough sand and clay behind to eventually fill the oxbow lake with dirt and other debris and the Indians would be forced to move. Judging from our radiocarbon dates, this process took a long time.

It has been our experience that middens bordering lakes, streams, or bays are steep on the water side and slope more gradually and more irregularly on the landward side. In other words, middens grow upward and away from the water. In our description of both Middens No. 1 and No. 2, we mentioned that one side was steep and the other more gradual. We would postulate that the steep side was towards the oxbow lake. A similar situation occurred at Kimball Island. Of course, an alternative hypothesis might be that now-completely-hidden springs once existed at these sites and that Indians exploited shellfish growing at these springs.

We conclude that around 3000 B.C. the channel of the St. Johns river was in a different location than today. Indians lived not only on the large bodies of water such as Lake Dexter but also on small oxbows or oxbow lakes. Middens No. 1, No. 2, and probably No. 3, were so situated. There the women and children collected *Viviparus* shells, turtles, and probably fish while the men and youths hunted deer and trapped rabbits and raccoons in the neighboring forests and swamps. Some vegetable products such as nuts, seeds, and the hearts of cabbage palms undoubtedly broadened this high protein diet.

Occasionally they met Indians from other small settlements. Villages on the large lakes prospered and became towns but those on the cut-off oxbows remained small as their supply of the stable shellfish was limited. Finally, shortly before 2000 B.C., the old oxbow lakes became filled and ceased to supply *Viviparus* shells in any quantity. When this event happened, it forced the abandonment of these small settlements and their inhabitants moved elsewhere.

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Plate VI. Excavating in lower part of Ocala National Forest Midden No. 2.

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